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December 2, 1958

R & D PROJECT

Report Number 4

This is the fourth report covering the design and fabrication of three magnetic tape recorders/reproducers. Recorders No. 1 and 2 are completed and have met the stringent space requirements for a three-track recorder/reproducer, entirely operated and powered by semi-conductors. The recorders furthermore have met the frequency response requirements and the wow and flutter and motion requirements.

Report Number 3 of September 29 described the motor design and the amplifiers along with other components that were necessary. Basically, the components supplied in Recorder No. 2 are the same with the exception of the fact that a DC to DC inverter was not required to power the amplifiers because of the higher available DC voltage.

Recorder No. 2 was to be designed to operate over a large voltage and frequency range. This was achieved by building a power supply which is metered and manually controlled to accept the voltage range, after which a low voltage is rectified to 24 volts DC. All operation is then accomplished from the DC. The equipment can therefore be operated from a 24 volt DC source, should there ever be a requirement.

The general electronic circuitry is very similar to Recorder No. 1 with the addition of an automatic gain control microphone amplifier which is used to modulate the center track.

The packaging of the equipment was very challenging because of the various large components which had to be mounted within a certain space limitation. In spite of the close proximity of the relatively large power transformer and rectifying elements along with the various stages of high gain electronic units, we have achieved a signal to noise better than 30 or 35 DB. The DC torque motors have worked out very satisfactorily and do not, in any way, contribute to a higher flutter reading which averages around .3% to .4% peak to peak. The frequency response on all three channels was down not more than 4 to 6 DB at 60 KC.

DEVELOPMENTS

While there were no major developments necessary in the fabrication of Recorder No. 2, we feel that the reel hold down assembly is a very novel and will be a most useful item. There has always been a problem of a reel hold down that will accept both a 5/16" spindle reel and the NARTB

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reel hub. The assembly that we have developed seems to answer this requirement very well and mounts the reels in a precision fashion but has no parts that may become dislodged or misplaced.

Our DC torque motors are probably very conventional in design; however, they are tailormade to the requirements of a high speed recorder and for DC operation. Their torque characteristics are most desirable for tape reeling and, as pointed out above, the action is extremely smooth without undesirable commutator cogging. They are also relatively efficient with low heat dissipation.

We designed a power transformer to meet the peculiar requirement of the specification and made it with a relatively low flux density to minimize spurious radiation.

Push button switches were used for simplified operation, and our power circuitry was designed to be as simple and fool proof as possible to handle the many functions required.

WORK TO BE DONE

Following a trip by one of the Corporation men to Washington, conferences disclosed the desirability of changing Recorder No. 3 to two-track operation instead of single track. Consequently, a letter for time extension was submitted, and work has been started on the two-track No. 3 unit. A new sub-miniature playback amplifier has been designed to permit the packaging of the various components within the allowable space. Work is being executed on a 3600 rpm hysteresis synchronous motor which, like the Recorders No. 1 and No. 2, will be semi-conductor powered. Continuing study is being applied to starting torque versus efficiency as it will not be possible to use a separate acceleration motor in the Recorder No. 3. Because of space problems, work is also being carried on covering the use of two phase instead of three phase as the reduction of components would be possible in two phase.

SUMMATION

The specifications have made possible the production of Recorders No. 1 and No. 2 which offer an efficient drive system and a somewhat miniaturized multi-track recording system. In reviewing the forthcoming possible requirements for some of this equipment, as many features have been added or considered on Recorder No. 2 as possible to make this unit adaptable for future requirements at different tape speeds or for different types of operation. While the units produced under this task must be considered as prototype, the equipment is complete within itself. Probably a number of improvements of construction could be made in future modifications and adaptations.

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